

Reply to Office Action of August 05, 2005
Amendment Dated: November 4, 2005

Appl. No.: 09/976,004
Attorney Docket No.: CSCO-010/4390

Listing of Claims

1 1 (Currently Amended): A method of setting up a plurality of virtual circuits between
2 a first end system and a second end system, said plurality of virtual circuits being set up on
3 a network connecting said first end system to said second end system, each of said plurality
4 of virtual circuits terminating at said first end system and said second end system, said
5 method being performed in a device between said first end system and said second end
6 system, said method comprising:
7 sending to said second end system a first signaling message requesting said plurality
8 of virtual circuits to be set up.

1 2 (Original): The method of claim 1, wherein said first signaling message comprises
2 a plurality of information elements, wherein a first information element is designed to
3 request set up of a single virtual circuit comprised in said plurality of virtual circuits, and
4 a second information element is designed to request set up of a second plurality of virtual
5 circuits comprised in said plurality of virtual circuits, further comprising:
6 receiving an acceptance message indicating that only said single virtual circuit is
7 possible to be provisioned if any of a plurality of switches in a connection path between said
8 first end system and said second end system is designed not to support said plurality of
9 virtual circuits.

1 3 (Original): The method of claim 2, wherein said second information element
2 comprises a non-mandatory information element according to a specification, wherein non-
3 mandatory information elements can be ignored by said plurality of switches according to
4 said specification.

1 4 (Original): The method of claim 3, wherein said specification comprises one of user
2 to network interface (UNI) and network to network interface (NNI).

1 5 (Original): The method of claim 1, further comprising:

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2 receiving an acceptance message, said acceptance message indicating that a plurality
3 of switches in a connection path between said first end system and said second end system
4 have set up said plurality of virtual circuits.

1 6 (Original): The method of claim 5, wherein said plurality of switches accept said
2 plurality of virtual circuits but immediately provision fewer than said plurality of virtual
3 circuits, said method further comprising:

4 sending a second signaling message to activate at least one of a plurality of not-yet-
5 provisioned virtual circuits comprised in said plurality of virtual circuits.

1 7 (Original): The method of claim 6, wherein said fewer than said plurality of virtual
2 circuits corresponds to one virtual circuit such that only one virtual circuit is provisioned in
3 response to said first signaling message.

1 8 (Original): The method of claim 5, wherein said plurality of virtual circuits is
2 treated as a group of virtual circuits, wherein said first end system and said second end
3 system support a plurality of groups including said group, said method further comprising
4 maintaining a bundle structure associated with each of said plurality of groups, wherein said
5 bundle structure stores information identifying the specific plurality of virtual circuits
6 forming the corresponding group.

1 9 (Original): The method of claim 8, further comprising:
2 maintaining a plurality of call reference structures, wherein each of said plurality of
3 call reference structures maintains the state of a call, wherein signaling messages related to
4 each group are received on a corresponding call; and
5 maintaining a plurality of per-VC structures, wherein each per-VC structure stores
6 information related to a plurality of call parameters accepted for a corresponding one of said
7 plurality of virtual circuits.

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1 10 (Original): The method of claim 9, wherein said sending, said receiving and each
2 of said maintaining are performed in a switch contained in said connection path, said
3 method further comprising:

4 maintaining a plurality of switch structures, wherein each of said plurality of switch
5 structures stores a mapping of an identifier of each of said virtual circuit in inbound
6 direction to another identifier of the virtual circuit in outbound direction;

7 mapping each identifier received in inbound direction to a corresponding identifier
8 in outbound direction using said plurality of switch structures.

1 11 (Original): The method of claim 9, wherein said first end system comprises an
2 edge router and wherein said method is performed in said first edge router, wherein said first
3 signaling message contains a bundle identifier which is propagated without translation by
4 each of said plurality of switches.

1 12 (Original): The method of claim 11, wherein each of said plurality of virtual
2 circuits comprises a switched virtual circuit.

1 13 (Original): The method of claim 6, wherein said acceptance message and said first
2 signaling message are both formed according to a common format, wherein said common
3 format contains a field which indicates whether a message comprises said acceptance
4 message or said first signaling message.

1 14 (Original): The method of claim 13, wherein said format allows a range of virtual
2 circuits to be specified, said format further allowing a plurality of traffic parameters to be
3 specified for all of said range of virtual circuits, wherein said plurality of parameters in said
4 first signaling message specify the desired parameters and said plurality of parameters in
5 said acceptance message specify the accepted parameters.

1 15 (Original): The method of claim 14, further comprising sending a release message
2 requesting release of another range of virtual circuits.

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1 16 (Currently Amended): A method of supporting the setting up of a plurality of
2 virtual circuits between a first end system and a second end system, said plurality of virtual
3 circuits being set up on a network connecting said first end system to said second end
4 system, each of said plurality of virtual circuits terminating at said first end system and said
5 second end system, said method being performed in a device, said method comprising:

6 receiving from said first end system a first signaling request requesting said plurality
7 of virtual circuits to be set up.

1 17 (Original): The method of claim 16, wherein said method further comprises
2 sending an acceptance message if said plurality of virtual circuits can be set up between said
3 device and said second end system in response to said first signaling request alone.

1 18 (Original): The method of claim 17, wherein said method further comprises
2 provisioning all of said plurality of virtual circuits before said sending.

1 19 (Original): The method of claim 17, further comprising provisioning fewer than
2 said plurality of virtual circuits to said second end system before performing said sending.

1 20 (Original): The method of claim 19, further comprising:
2 receiving a second signaling message requesting activation of at least one of said not-
3 yet-provisioned virtual circuits comprised in said plurality of virtual circuits;
4 completing provisioning of said at least one of said not-yet-provisioned virtual
5 circuits; and
6 sending a completion message indicating said at least one of said not-yet-provisioned
7 virtual circuits have been activated.

1 21 (Original): The method of claim 20, wherein said first signaling message contains
2 a plurality of parameters related to a range of virtual circuits comprised in said plurality of
3 virtual circuits, said method further comprising:

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4 storing said plurality of parameters associated with said range of virtual circuits; and
5 provisioning said range of virtual circuits using said plurality of parameters,
6 whereby said plurality of parameters are transmitted only once for provisioning said
7 range of virtual circuits.

1 22 (Original): The method of claim 21, wherein said first signaling request and said
2 second signaling message are received in the form of ATM cells.

1 23 (Original): The method of claim 22, wherein said device comprises one of said
2 first end system, said second end system and a switch in the path of said plurality of virtual
3 circuits connecting said first end system to said second end system.

4 24 (Original): A device for setting up a plurality of virtual circuits between a first end
5 system and a second end system, said plurality of virtual circuits being set up on a network
6 connecting said first end system to said second end system, said device comprising:
7 an outbound interface coupled to said network;
8 a message construction block coupled to said outbound interface; and
9 a call control logic for causing said message construction block to construct a first
10 signaling message requesting said plurality of virtual circuits to be set up, and to send said
11 first signaling message on said network to said second end system.

1 25 (Original): The device of claim 24, further comprising a signaling application
2 programming interface (API), said signaling API receiving a request for a group of virtual
3 circuits from an external application, and communicating said request to said call control
4 logic, wherein said call control logic causes said first signaling message to be sent in
5 response to said request.

1 26 (Original): The device of claim 25, wherein said outbound interface sends said
2 first signaling message in the form of a plurality of asynchronous transfer mode (ATM) cells,
3 said device further comprising:

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4 a signaling ATM adaptation layer (SAAL) output block to encapsulate data generated
5 by said message construction block to generate said first signaling message, said SAAL
6 output block being coupled to said outbound interface.

1 27 (Original): The device of claim 24, wherein said first signaling message comprises
2 a plurality of information elements, wherein a first information element is designed to
3 request set up of a single virtual circuit comprised in said plurality of virtual circuits, and
4 a second information element is designed to request set up of a second plurality of virtual
5 circuits comprised in said plurality of virtual circuits, said device further comprising:

6 an inbound interface receiving on said network an acceptance message indicating that
7 only said single virtual circuit is possible to be provisioned if any of a plurality of switches
8 in a connection path between said first end system and said second end system is designed
9 not to support said plurality of virtual circuits; and

10 a parser examining said acceptance message and forwarding said acceptance message
11 to said call control logic.

1 28 (Original): The device of claim 27, wherein said second information element
2 comprises a non-mandatory information element according to a specification, wherein
3 non-mandatory information elements can be ignored by said plurality of switches according
4 to said specification.

1 29 (Original): The device of claim 28, wherein said specification comprises one of
2 user to network interface (UNI) and network to network interface (NNI).

1 30 (Original): The device of claim 24, further comprising an inbound interface
2 receiving an acceptance message, said acceptance message indicating that a plurality of
3 switches in a connection path between said first end system and said second end system have
4 set up said plurality of virtual circuits.

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1 31 (Original): The device of claim 30, wherein said plurality of switches accept said
2 plurality of virtual circuits but immediately provision fewer than said plurality of virtual
3 circuits, wherein said call control logic causes said message construction block to send a
4 second signaling message to activate at least one of a plurality of not-yet-provisioned virtual
5 circuits comprised in said plurality of virtual circuits.

1 32 (Original): The device of claim 30, wherein said plurality of virtual circuits is
2 treated as a group of virtual circuits, wherein said first end system and said second end
3 system support a plurality of groups including said group, said device further comprising a
4 memory storing a bundle structure associated with each of said plurality of groups, wherein
5 said bundle structure stores information identifying the specific plurality of virtual circuits
6 forming the corresponding group.

1 33 (Original): The device of claim 32, wherein said memory further stores a plurality
2 of call reference structures and a plurality of per-VC structures,
3 wherein each of said plurality of call reference structures maintains the state of a call,
4 wherein signaling messages related to each group are received on a corresponding call, and
5 wherein each per-VC structure stores information related to a plurality of call
6 parameters accepted for a corresponding one of said plurality of virtual circuits.

1 34 (Original): The device of claim 33, wherein said device comprises a switch in said
2 connection path, said memory storing a plurality of switch structures, wherein each of said
3 plurality of switch structures stores a mapping of an identifier of each of said virtual circuit
4 in inbound direction to another identifier of the virtual circuit in outbound direction.

1 35 (Original): The device of claim 33, wherein said first end system comprises an
2 edge router, wherein said first signaling message contains a bundle identifier which is
3 propagated without translation by each of said plurality of switches.

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1 36 (Original): The device of claim 30, wherein said acceptance message and said first
2 signaling message are both formed according to a common format, whereinsaidcommon
3 format contains a field which indicates whether a message comprises said acceptance
4 message or said first signaling message.

1 37 (Original): The device of claim 36, wherein said format allows a range of virtual
2 circuits to be specified, said format further allowing a plurality of traffic parameters to be
3 specified for all of said range of virtual circuits, wherein said plurality of parameters in said
4 first signaling message specify the desired parameters and said plurality of parameters in
5 said acceptance message specify the accepted parameters.

1 38 (Currently Amended): An device apparatus for supporting the setting up of a
2 plurality of virtual circuits between a first end system and a second end system, said plurality
3 of virtual circuits being set up on a network connecting said first end system to said second
4 end system, said plurality of virtual circuits terminating at said first end system and said
5 second end system, said device apparatus comprising:
6 an in-bound interface receiving from said first end system a first signaling request
7 requesting said plurality of virtual circuits to be set up.

1 39 (Currently Amended): The device apparatus of claim 38, wherein said device
2 apparatus further comprises a call control logic receiving said first signaling message, said
3 device apparatus sending an acceptance message if said plurality of virtual circuits can be
4 set up between said device apparatus and said second end system in response to said first
5 signaling request alone.

1 40 (Currently Amended): The device apparatus of claim 39, wherein said call control
2 logic provisions all of said plurality of virtual circuits before sending said acceptance
3 message.

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1 41 (Currently Amended): The ~~device~~ apparatus of claim 39, wherein said call control
2 logic provisions fewer than said plurality of virtual circuits to said second end system before
3 sending said acceptance message.

1 42 (Currently Amended): The ~~device~~ apparatus of claim 41, wherein said inbound
2 interface receives a second signaling message requesting activation of at least one of said
3 not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits, wherein
4 said call control logic completes provisioning of said at least one of said not-yet-provisioned
5 virtual circuits and then sends a completion message indicating said at least one of said not-
6 yet-provisioned virtual circuits have been activated.

1 43 (Currently Amended): The ~~device~~ apparatus of claim 42, wherein said first
2 signaling message contains a plurality of parameters related to a range of virtual circuits
3 comprised in said plurality of virtual circuits, said ~~device~~ apparatus further comprising a
4 memory storing said plurality of parameters associated with said range of virtual circuits,
5 wherein said call control logic 550 provisions said range of virtual circuits using said
6 plurality of parameters, whereby said plurality of parameters are transmitted only once for
7 provisioning said range of virtual circuits.

1 44 (Currently Amended): The ~~device~~ apparatus of claim 43, wherein said ~~device~~
2 comprises one of said first end system, said second end system and a switch in the path of
3 said plurality of virtual circuits connecting said first end system to said second end system.

1 45 (Currently Amended): A device for setting up a plurality of virtual circuits
2 between a first end system and a second end system, said plurality of virtual circuits being
3 set up on a network connecting said first end system to said second end system, said plurality
4 of virtual circuits terminating at said first end system and said second end system, said
5 device being located in a communication path between said first end system and said second
6 end system, said device comprising:

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7 means for sending to said second end system a first signaling message requesting said
8 plurality of virtual circuits to be set up.

1 46 (Original): The device of claim 45, wherein said first signaling message comprises
2 a plurality of information elements, wherein a first information element is designed to
3 request set up of a single virtual circuit comprised in said plurality of virtual circuits, and
4 a second information element is designed to request set up of a second plurality of virtual
5 circuits comprised in said plurality of virtual circuits, said device further comprising:

6 means for receiving an acceptance message indicating that only said single virtual
7 circuit is possible to be provisioned if any of a plurality of switches in a connection path
8 between said first end system and said second end system is designed not to support said
9 plurality of virtual circuits.

1 47 (Original): The device of claim 46, wherein said second information element
2 comprises a non-mandatory information element according to a specification, wherein non-
3 mandatory information elements can be ignored by said plurality of switches according to
4 said specification.

1 48 (Original): The device of claim 47, wherein said specification comprises one of
2 user to network interface (UNI) and network to network interface (NNI).

1 49 (Original): The device of claim 41, further comprising:

2 means for receiving an acceptance message, said acceptance message indicating that
3 a plurality of switches in a connection path between said first end system and said second
4 end system have set up said plurality of virtual circuits.

1 50 (Original): The device of claim 49, wherein said plurality of switches accept said
2 plurality of virtual circuits but immediately provision fewer than said plurality of virtual
3 circuits, said device further comprising:

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4 means for sending a second signaling message to activate at least one of a plurality
5 of not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits.

1 51 (Original): The device of claim 50, wherein said plurality of virtual circuits is
2 treated as a group of virtual circuits, wherein said first end system and said second end
3 system support a plurality of groups including said group, said device further comprising
4 means for storing a bundle structure associated with each of said plurality of groups, wherein
5 said bundle structure stores information identifying the specific plurality of virtual circuits
6 forming the corresponding group.

1 52 (Original): The device of claim 51, further comprising:
2 means for storing a plurality of call reference structures, wherein each of said
3 plurality of call reference structures maintains the state of a call, wherein signaling messages
4 related to each group are received on a corresponding call; and
5 means for a plurality of per-VC structures, wherein each per-VC structure stores
6 information related to a plurality of call parameters accepted for a corresponding one of said
7 plurality of virtual circuits.

1 53 (Currently Amended): A device for supporting the setting up of a plurality of
2 virtual circuits between a first end system and a second end system, said plurality of virtual
3 circuits being set up on a network connecting said first end system to said second end
4 system, each of said plurality of virtual circuits terminating at said first end system and said
5 second end system, said device comprising:
6 means for receiving from said first end system a first signaling request requesting said
7 plurality of virtual circuits to be set up.

1 54 (Original): The device of claim 53, wherein said device further comprises means
2 for sending an acceptance message if said plurality of virtual circuits can be set up between
3 said device and said second end system in response to said first signaling request alone.

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1 55 (Original): The device of claim 54, wherein said device further comprises means
2 for provisioning all of said plurality of virtual circuits before sending said acceptance
3 message.

1 56 (Original): The device of claim 54, further comprising means for provisioning
2 fewer than said plurality of virtual circuits to said second end system before performing said
3 sending.

1 57 (Original): The device of claim 56, further comprising:
2 means for receiving a second signaling message requesting activation of at least one
3 of said not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits;
4 means for completing provisioning of said at least one of said not-yet-provisioned
5 virtual circuits; and
6 means for sending a completion message indicating said at least one of said not-yet-
7 provisioned virtual circuits have been activated.

1 58 (Original): The device of claim 57, wherein said first signaling message contains
2 a plurality of parameters related to a range of virtual circuits comprised in said plurality of
3 virtual circuits, said device further comprising:
4 means for storing said plurality of parameters associated with said range of virtual
5 circuits; and
6 means of provisioning said range of virtual circuits using said plurality of parameters,
7 whereby said plurality of parameters are transmitted only once for provisioning said
8 range of virtual circuits.

1 59 (Currently Amended): A computer readable medium carrying one or more
2 sequences of instructions for causing a device to set up a plurality of virtual circuits between
3 a first end system and a second end system, said plurality of virtual circuits being set up on
4 a network connecting said first end system to said second end system, each of said plurality
5 of virtual circuits terminating at said first end system and said second end system, said

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6 device being located in a communication path located between said first end system and said
7 second end system, wherein execution of said one or more sequences of instructions by one
8 or more processors contained in said device causes said one or more processors to perform
9 the action of:

10 sending to said second end system a first signaling message requesting said plurality
11 of virtual circuits to be set up.

1 60 (Original): The computer readable medium of claim 59, wherein said first
2 signaling message comprises a plurality of information elements, wherein a first information
3 element is designed to request set up of a single virtual circuit comprised in said plurality
4 of virtual circuits, and a second information element is designed to request set up of a second
5 plurality of virtual circuits comprised in said plurality of virtual circuits, further comprising:
6 receiving an acceptance message indicating that only said single virtual circuit is
7 possible to be provisioned if any of a plurality of switches in a connection path between said
8 first end system and said second end system is designed not to support said plurality of
9 virtual circuits.

1 61 (Original): The computer readable medium of claim 60, wherein said second
2 information element comprises a non-mandatory information element according to a
3 specification, wherein non-mandatory information elements can be ignored by said plurality
4 of switches according to said specification.

1 62 (Original): The computer readable medium of claim 59, further comprising:
2 receiving an acceptance message, said acceptance message indicating that a plurality
3 of switches in a connection path between said first end system and said second end system
4 have set up said plurality of virtual circuits.

1 63 (Original): The computer readable medium of claim 62, wherein said plurality of
2 switches accept said plurality of virtual circuits but immediately provision fewer than said
3 plurality of virtual circuits, further comprising:

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4 sending a second signaling message to activate at least one of a plurality of not-yet-
5 provisioned virtual circuits comprised in said plurality of virtual circuits.

1 64 (Original): The computer readable medium of claim 63, wherein said fewer than
2 said plurality of virtual circuits corresponds to one virtual circuit such that only one virtual
3 circuit is provisioned in response to said first signaling message.

1 65 (Original): The computer readable medium of claim 64, wherein said plurality of
2 virtual circuits is treated as a group of virtual circuits, wherein said first end system and said
3 second end system support a plurality of groups including said group, further comprising
4 maintaining a bundle structure associated with each of said plurality of groups, wherein said
5 bundle structure stores information identifying the specific plurality of virtual circuits
6 forming the corresponding group.

1 66 (Original): The computer readable medium of claim 65, further comprising:
2 maintaining a plurality of call reference structures, wherein each of said plurality of
3 call reference structures maintains the state of a call, wherein signaling messages related to
4 each group are received on a corresponding call; and
5 maintaining a plurality of per-VC structures, wherein each per-VC structure stores
6 information related to a plurality of call parameters accepted for a corresponding one of said
7 plurality of virtual circuits.

1 67 (Original): The computer readable medium of claim 66, wherein said sending, said
2 receiving and each of said maintaining are performed in a switch contained in said
3 connection path, further comprising:
4 maintaining a plurality of switch structures, wherein each of said plurality of switch
5 structures stores a mapping of an identifier of each of said virtual circuit in inbound
6 direction to another identifier of the virtual circuit in outbound direction;
7 mapping each identifier received in inbound direction to a corresponding identifier
8 in outbound direction using said plurality of switch structures.

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1 68 (Original): The computer readable medium of claim 66, wherein said first end
2 system comprises an edge router and wherein said actions are performed in said first edge
3 router, wherein said first signaling message contains a bundle identifier which is propagated
4 without translation by each of said plurality of switches.

1 69 (Original): The computer readable medium of claim 62, wherein said acceptance
2 message and said first signaling message are both formed according to a common format,
3 wherein said common format contains a field which indicates whether a message comprises
4 said acceptance message or said first signaling message.

1 70 (Original): The computer readable medium of claim 69, wherein said format
2 allows a range of virtual circuits to be specified, said format further allowing a plurality of
3 traffic parameters to be specified for all of said range of virtual circuits, wherein said
4 plurality of parameters in said first signaling message specify the desired parameters and
5 said plurality of parameters in said acceptance message specify the accepted parameters.

1 71 (Original): The computer readable medium of claim 70, further comprising
2 sending a release message requesting release of another range of virtual circuits.

1 72 (Currently Amended): A computer readable medium carrying one or more
2 sequences of instructions for causing a device to support the setting up of a plurality of
3 virtual circuits between a first end system and a second end system, said plurality of virtual
4 circuits being set up on a network connecting said first end system to said second end
5 system, each of said plurality of virtual circuits terminating at said first end system and said
6 second end system, wherein execution of said one or more sequences of instructions by one
7 or more processors contained in said device causes said one or more processors to perform
8 the action of:

9 receiving from said first end system a first signaling request requesting said plurality
10 of virtual circuits to be set up.

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1 73 (Original): The computer readable medium of claim 72, further comprising
2 sending an acceptance message if said plurality of virtual circuits can be set up between said
3 device and said second end system in response to said first signaling request alone.

1 74 (Original): The computer readable medium of claim 73, further comprising
2 provisioning all of said plurality of virtual circuits before said sending.

1 75 (Original): The computer readable medium of claim 73, further comprising
2 provisioning fewer than said plurality of virtual circuits to said second end system before
3 performing said sending.

1 76 (Original): The computer readable medium of claim 75, further comprising:
2 receiving a second signaling message requesting activation of at least one of said not-
3 yet-provisioned virtual circuits comprised in said plurality of virtual circuits;
4 completing provisioning of said at least one of said not-yet-provisioned virtual
5 circuits; and
6 sending a completion message indicating said at least one of said not-yet-provisioned
7 virtual circuits have been activated.

1 77 (Original): The computer readable medium of claim 76, wherein said first
2 signaling message contains a plurality of parameters related to a range of virtual circuits
3 comprised in said plurality of virtual circuits, further comprising:
4 storing said plurality of parameters associated with said range of virtual circuits; and
5 provisioning said range of virtual circuits using said plurality of parameters,
6 whereby said plurality of parameters are transmitted only once for provisioning said
7 range of virtual circuits.

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- 1 78 (New): The method of claim 1, wherein each of said plurality of virtual circuits
- 2 comprises a asynchronous transfer mode (A TM) virtual circuit provided between said first
- 3 end system and said second end system.